FOR HISTORIANS AND COLLECTORS

VINTAGE SOUND ITEMS

THE HORN SPEAKER

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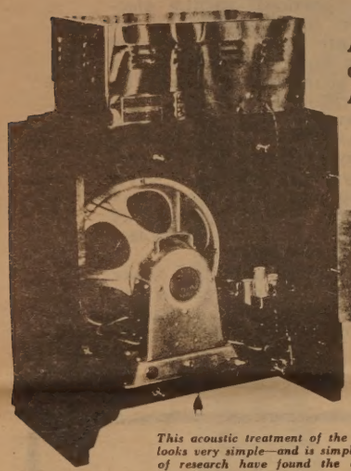
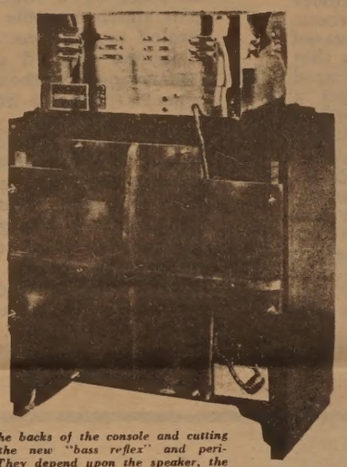
Full Range Bass Reproduction Achieved for First Time in History!

An invention by the Chief Engineer of the Jensen Speaker Company — Available with no other radio except the MASTERPIECE V.

JANUARY, 1937



This acoustic treatment of the distinctive Clifton console looks very simple—and is simple. After twenty-odd years of research have found the answer to full-range bass reproduction. Here the acoustically deadened back is shown removed to give access to the 18" 44 pound, super-giant speaker.



No, just closing in the backs of the console and cutting slots doesn't give the new "bass reflex" and peri-dynamic" benefits. They depend upon the speaker, the console size and construction and HOW the back is closed and the SIZE and ARRANGEMENT of the "bass reflex" parts.

Radio users have never heard real bass notes from any radio. The average quite large radio cabinet acting as a baffle for the loud-speaker it contains, cuts off usually at about 130 cycles. True, some notes below 130 cycles are partially reproduced where the speaker cone itself is quite large, and by virtue of cabinet resonance. The vertical, horizontal and depth dimensions of the cabinet, if different, will contribute resonance peaks which may often aid bass reproduction. Except in very heavy and solid cabinets, these resonances usually are so sharp as to cause annoying "boominess", and not true natural bass reproduction. In customary thin veneer cabinets they are very troublesome, as witness the use of "acoustic clarifiers" to absorb these annoying cabinet resonances in recent thin veneer cabinets.

For a loud speaker to actually reproduce down to 20 cycles, it would have to be mounted in the center of a 28.25 foot square baffle—the side of a house conveys a good idea of such an "infinite baffle", but is hardly ideal for one's living room. The mechanical design of the loud-speaker itself would have to be most unusual to get down below 30 cycles, even in such an ideal case.

Of late much study has been given to baffles, as evidenced by the labyrinthine folding back of a rear air-path on itself and the boxing in with tin vent pipes of loud speakers. Realizing that the true baffle is not the small board behind the grille in a cabinet to which a loud speaker is usually fastened, but is any means providing a long air path from front to back of the loud speaker (see ALL WAVE RADIO, January, 1937, issue, page 26), is the first requisite for understanding what follows. The longer this front to back air-path, the lower down in the musical register will the loud-speaker reproduce. In one widely advertised construction this path is made long by folding it back on itself inside the back of the cabinet through an acoustic network or lengthened air-path. It is a considerable step in the right direction, even though it is mechanically difficult in the limited space available to fold the front to back air-path sufficiently upon itself to extend the bass response down to the deeep fundamental bass tone.

In another case the usually open cabinet back is tightly sealed in. But, as something must happen to the air alternately compressed and rarefied inside the relatively small sealed cabinet as the speaker cone moves forward and backard in reproduction, tin vent pipes are placed over holes in the cabinet floor. These tubes may be proportioned to substantially resonate at several low frequencies, and coupled to the speaker diaphragm (cone) through the air in the cabinet, somewhat augment bass response.

Both the above developments are excellent steps forward toward true and not synthetic (if any) bass reproduction, but there has now been developed a more simple and completely effective solution on these stepping stones of engineering development.

The fundamental problem in finally attaining true and not synthetic reproduction of all bass tones below the unbelievable but never-the-less actual, average 130 cycle radio cabinet cut-off, and to extend the true tone range down to below the lowest 40 to 50 cycle notes handled by broadcast stations or phonograph records, is to provide the loud-speaker with an infinite baffle. This is an obvious physical impossibility in terms of a flat baffle but actual performance in *excess* of that theoretically possible to an infinite baffle can be had if a large enough and heavy enough cabinet is had as a starting point.

It is vitally important that this cabinet have ample internal space. This will be eight cubic feet or more if, for example, it is to house the 18 inch Super-Giant loud speaker of the MASTERPIECE V, which it *must* if the combination is to get down to 30 cycles. It is equally important that this cabinet be non-vibratory, which means that it must be unusually solidly constructed of heavy well-seasoned and dried lumber from ⅞ inch to 1½ inch thick. Even such a solid assembly, which no *ordinary* radio cabinet even approaches, must have its own resonance further deadened by having discreet amounts of sound deadening material attached to its inside flat surfaces, for the cabinet absolutely must not vibrate when the speaker is in operation and the natural vibration of the air contained in it must be deadened. Side, top and bottom panel resonance must be eliminated by heavy construction, or spurious sound radiation will occur from these sources (of a tone-quality ruinous nature) in the form of transients from these secondary sound sources. Such a loud-speaker cabinet obtained, it is still only somewhat better than ordinary, and still reproduces little below the usual 130 cycle cut-off frequency, but performance not equalling, but exceeding, that possible to an infinite baffle is now within reach, thanks to the genius of Jensen loud-speaker engineers.

The long engineering story of how this was discovered, and the formulae governing every step of the specific designs is probably of little interest to the reader whose appetite has been whetted for this first ear-ful of true bass reproduction, so the engineering details will be skipped (they were contained in five papers delivered by Hugh S. Knowles before Rochester, Toronto, Cleveland and Chicago meetings of the Institute of Radio Engineers and the Engineering Institute of Canada quite recently). Assuming the reader now has a *solid* cabinet, the front of which is braced and deadened by a more than usually heavy speaker "baffle board", and the top, bottom and sides are so relatively small and thick that internal resonance can be deadened by tacked-on jute, the tight and firm attaching of a solid back to enclose and seal his cabinet will give the reader reproduction exceeding that of the theoretically ideal "infinite baffle."

But in the italicized word "solid" above will lie the success or failure of the endeavor. Since this cabinet back will be relatively large, and supported along only its edges, it *must be solid.* This means that it should be made of ⅞ inch solid lumber, but as this isn't solid enough, and as the cabinet back must be a minimum distance away from any wall, the back must be cross-braced by ⅞ inch x 2½ inch bracing beams, glued and screwed to the outside of the back. Placed from top to bottom and from side to side, and notched to cross in the middle, these cross braces are set on edge to completely stiffen the removable back, and to insure its being placed the required minimum distance away from the nearest wall.

Since the loud-speaker field, consuming appreciable power when in operation, will get warm, and since it would get hot if it were tightly enclosed, needed ventilation as well as basically new and important acoustic considerations, involving phase reversal of opposed front and back speaker sound radiation, so that both front and rear sound radiation *now add instead of cancel*, dictate the need for vent holes or cutouts in the cabinet back. These cut-outs may not be of haphazard size or placement, but must be of carefully determined size and location for acoustic reasons. Good ventilation dictates that at least one aperture be at the top and another at the bottom, since air heated by the speaker and power amplifier contained in the cabinet will rise. Thus a bottom port hole and another at the top will form a draft to conduct off heat generated in operation and so avoid excessive heating of the cabinet interior.

The improvement which these consoles, incorporating the new "bass reflex" (addition rather than usual opposition and cancellation of opposed front and back sound radiation) and "peri-dynamic" (enclosed speaker) principles, bring to sound reproduction cannot be visualized from the simple statement that, with a fine loud speaker, they only extend the tone range from an averaged 130 down to 30 cycles, for this does not describe an almost equally valuable distortion

(Continued on page 5)

The reproducer exceeding the performance possibilities of an infinite baffle, herein described in print for the first time, is a very major contribution to sound reproduction. Developed by Hugh S. Knowles, Chief Engineer of Jensen Radio Mfg. Co., and formerly of McMurdo Silver's engineering staff, it at last surmounts the barrier which has always stood between the listener and true full range reproduction of fundamental bass tones.

In line with the policy of being first in giving to our clients every worthwhile engineering development, we take pride in being first to offer radio consoles designed by Hugh S. Knowles and McMurdo Silver to give to MASTERPIECE owners the full benefits of the startling new "bass-reflex" and "peri-dynamic" principles which culminate in sound reproduction *exceeding* that possible from an "infinite baffle."

It is unnecessary for us to say that this is revolutionary — five papers already delivered by Mr. Knowles at the request of different chapters of the Institute of Radio Engineers and The Engineering Institute of Canada will prove conclusively that it is the most important single sound reproducing development since Peter Jensen's invention of the dynamic loud speaker.

Full range sound reproduction from 30 to 9000 cycles has never been heard before, even with a MASTERPIECE V. Through Silver pioneering it may now be anyone's pleasure.

My Trip in the Electron Bottle

By L. Hectron

LAST night, while listening to the program from WJZ, I was observing my vacuum tube and thinking how wonderful it was to have the music coming from the air transformed into audible sounds through the little lamp burning before me. I decided to find out more about it and how it was working, so I took a book, when the concert was over, and started to read how the vacuum tube works. At first it seemed simple, but the more I read the more complicated it seemed and I found myself, at about 12:30 P. M., plunging into electrons, positives, negatives, grids, plates, etc. The whole thing seemed to be mixed up and I stopped reading and tried to understand exactly the meaning of all this.

Suddenly the light in the room grew dimmer and I felt tired; all I remember is that two men came into the room. They were equipped with what appeared to be diving suits and funny outfits that looked like the gas-masks that we used to wear during the war. Without a word, one of the men gave me a similiar outfit and helped me to put it on. Later, I found that this was some special apparatus such as that used by the divers to obtain air while under the water. Then, before I could realize what was happening, I found myself in a tremendously big glass bulb. I could hear a hissing sound, but could not see anything around me! One of the men then touched me on the shoulder and pointing upward showed me the strangest spectacle I have ever seen.

On the left was a big luminous rod, as brilliant as the sun, from which could be seen small white bullets flying in space like drops of rain. On the right was a large, flat metallic plate which the small bullets were hitting. In the space between the luminous rod and the large metallic plate was what looked like a big pipe of zig-zag shape supported from the top. This, too, was vibrating and I could see the small white balls disappear as they touched the pipe. They seemed to melt one instant and to be repulsed the next, and at the same time, there arose a fog all around the luminous rod and the rain of the small balls upon the plate decreased in intensity. It was, indeed, a strange sight.

For a time, I observed what looked like a regular bombardment of a big tin plate by a million or so machine guns attached to the luminous rod; then turning toward one of my companions, I pointed upward asking him for an explanation. Without a word, he took from his pocket a little book and opening it, pointed to a paragraph. This is what I read: "The filament, when connected to a source of current, becomes hot and emits in the surrounding space some electrons. These electrons, which are negatively charged, are, of course, attracted by the plate which is positively charged by means of a high tension battery. The grid or third element in the tube is interposed between the filaments and the plate, acting as a shutter which may be closed and will consequently stop the electrons midway, preventing them from reaching the plate. When the grid is itself positive, it acts as do the plates, that is, it attracts the electrons. However, the surface of the wire composing the grid is small in comparison with that of the plate, and only a few electrons are stopped in their flight to the plate; the greatest number of electrons reach the plate and a strong current flows into the plate circuit.

"When the grid is charged negatively, instead of attracting the electrons, it repulses them because they are negatively charged and it is well known that two similiar polarities repulse each other. The repulsive effect is such that not only no electrons reach the grid, but few reach the plate, reducing considerably the current in the plate circuit as it is proportional to the electrons' flow from the filaments to the plate. During all the time, the grid remains negative and the electrons are crowded in the space between the filament and the grid, but as soon as the grid polarity changes, they rush again to the plates as the obstacle is then removed. It may be understood, therefore, that the system works as a valve which, having no mechanical part, may be operated at any speed, opening and closing the plate circuit when the polarity of the grid is changed."

With a clear understanding, I woke up. It was all a dream and I found myself with the book in my hand, staring toward the ceiling looking for the electrons.

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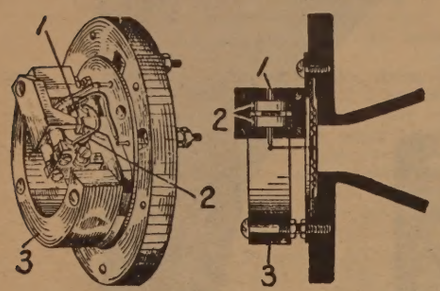
What You Would See if You Were Inside of an old de Forest Bulb. On the Left Is Shown What Happens When the Grid Is Positive, and on the Right When it is Negative.

New Power Amplifier and Loud-Speaking Receiver

1921

A WELL-KNOWN American telephone manufacturer has recently placed on the market a power amplifier and loud-speaking receiver, which is here described in detail. This has been brought out because of the widespread interest that has been displayed in the receiving of broadcasted news, music, and entertainment, by private radiophone operators. It is designed to be used in connection with a regular receiving tuner, and a detector with one or two steps of amplification. The outfit consists of a loud-speaking receiver especially designed for radio work, and a two-stage vacuum tube power amplifier, equipped with three special vacuum tubes, connected as shown in the accompanying diagram.

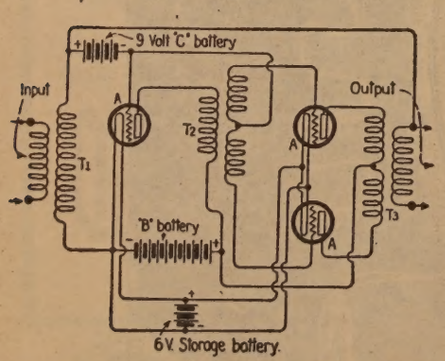


This View of the New Radio Loud-Speaker Here Described Clearly Demonstrates Its Simplicity, No Large Separately Excited Field Magnets Being Necessary. The Moving Armature is Linked by Means of a Delicately Pivoted Lever System to a Corrugated Diaphragm of Iron, or in Some Cases Bakelite.

The makers claim that this set, when used in connection with a well designed vacuum tube receiving set, and supplied with the necessary current, will reproduce all forms of music and speech with wonderful clarity and quality of tone, sufficient to fill public halls and theatres of medium size.

The tubes employed with this set are especially designed for the circuit used. They make use of a special oxide coated filament which insures maximum electron emission with minimum filament temperature. The tubes, when in operation, glow dull red, which feature insures long life and minimum filament power consumption.

The amplifier unit consists of a wooden cabinet, measuring approximately 12½"x 10"x4½", which carries a panel of insulating material. Upon this panel are mounted a switch, of the push and pull type, to control the filament current; a five point switch to control the volume of sound; sockets for the three special vacuum tubes, and the necessary binding posts for connections.

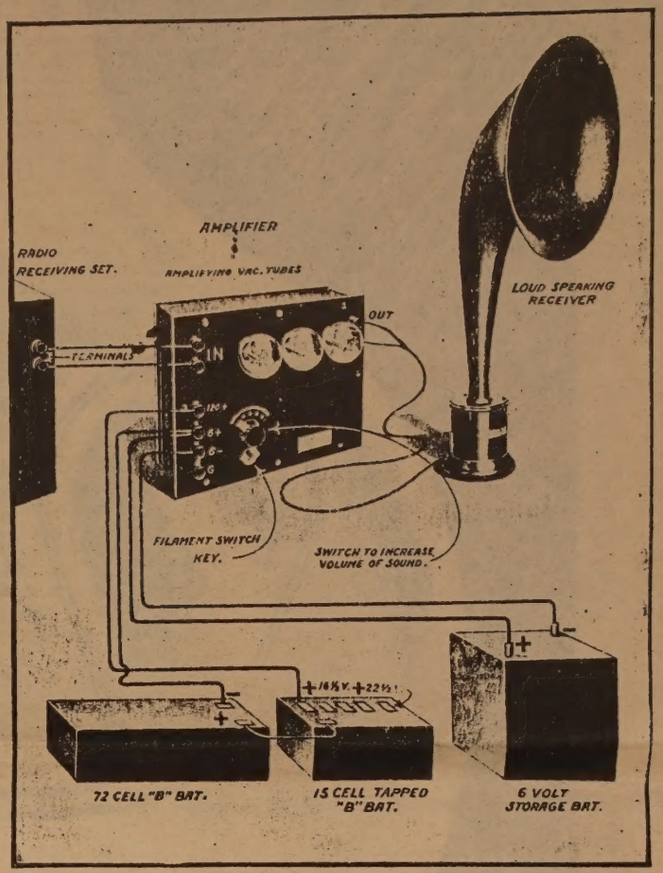


The Schematic Circuit Here Shown For the Radio Loud-Talker Gives a Clear Idea of the Electrical Circuits Employed For the Three Power Tubes and Special Tapped Transformers, "C" Battery, etc.

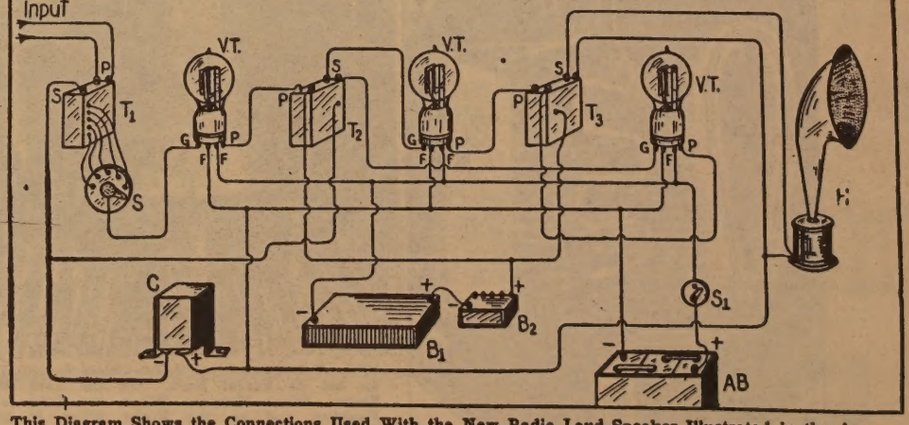
The circuit of the amplifier is unique in that it employs three vacuum tubes for two steps of amplification. As may be seen from the accompanying circuit diagram, the volume of sound is controlled by cutting in more or less of the first amplifying transformer secondary, by means of the five point switch. The second and third tubes are connected in parallel, and each receives its plate voltage thru half of the primary of the third transformer. The circuit of these two tubes is of the balanced or "push pull" type so that each tube is required to handle only one-half of the energy delivered to the receiver. This circuit increases the operating margins of the outfit and reduces distortion to a minimum. A "C" battery with a potential of nine volts is used to impress a negative biasing charge on the grid. A plate voltage of 120 volts is used and a filament voltage of six volts.

The loud-speaker itself is of the pivoted armature type, actuated by magnets with a resistance of 325 ohms, and connected by means of a rod to a corrugated diafram, made of soft Norwegian iron. This construction may be readily seen from the accompanying cut. The entire receiver is mounted in a metal housing and used with a curved horn especially designed to give adequate volume and pure tone.

The two units, that is, the amplifier cabinet, and the loud-speaking receiver, are especially designed to be used together and to give a maximum volume of sound with a minimum distortion, whose success the editors can testify to, as they have heard several of these outfits in operation. A special feature is that no storage battery current is consumed in exciting a field magnet.



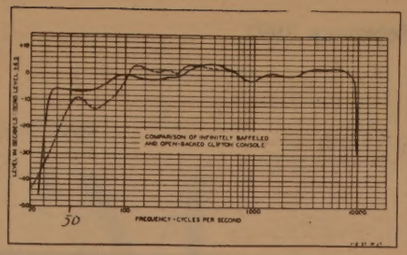
This Photo-Diagram Shows the Latest Type of Radio Loud-Speaker Which Is Remarkable For Its Clarity of Tone and Freedom From Howling and Frying Noises. The Loud-Speaker Shown Requires No Separately Excited Field, a Special V. T. Amplifier Cabinet Being Used With It, However; This Cabinet Containing Three Special Power V. T.'s, Besides the Necessary Transformers and Control Switch.



This Diagram Shows the Connections Used With the New Radio Loud-Speaker Illustrated in the Accompanying Photo. The Transformer T2 Has a Tap From the Center of the Secondary, While the Transformer T3 Has a Tap From the Center of the Primary Winding. This Power Amplifier Circuit Operates on What is Called the Push-Pull System, and It Gives Very Excellent Results Indeed; Great Stability and Freedom From Howling Being Two of Its Outstanding Features.

eliminating benefit. In the ordinary radio cabinet, used with a good loud speaker and amplifier which may go down to as low as 30 cycles if of unusually high quality, the bass notes such a system is called upon to reproduce will load up the amplifier and loud speaker, even though they are not heard as sound at their fundamental tones. They are not heard because of the inability of the small baffle to properly load the loud speaker cone, which results in its overload, or excessive excursions of the speaker cone even though the small baffle does not permit it to do any useful work at these low fundamental frequencies. This results in the strengthening (through distortion) of the harmonics of the low notes, and these are what the listener hears and has had to be satisfied with in place of fundamental bass notes every reproducer has lost.

The "bass reflex" principle properly loading the speaker cone at low frequencies, actually reproduces such low frequencies, and completely eliminates the usual excessively strong harmonies and their distortion. This results in a "cleaning up" of reproduced sound that is as startling in itself as is the new and at last natural concept of full range bass reproduction completely free of "boominess" which the cabinets illustrated now provide for the first time, bringing as they do to sound reproduction full, deep and round bass without customary "boominess" and barrel-like tone. Speech is as clear as music—full, complete, and without distorting emphasis employed to synthetically simulate previously missing bass tones.



The tremendous improvement in musical perfection which the principles herein described for the first time bring to radio reception is graphically shown by these curves. The dotted line shows the commercially unusually excellent response range of the Masterpiece V in its open backed Clifton, Oxford, Bristol or Norwich consoles. The solid line, run upon these same consoles after acoustic treatment, tells the story of the final attainment that radio and sound engineers have been working for ever since broadcasting began, and which Jensen-Silver engineering finally makes possible.

The response curves herewith are for the CLIFTON, OXFORD, BRISTOL and NORWICH consoles. The dotted line shows the antenna to ear frequency response of the regular consoles with their open backs 2½" away from a wall. The tremendous improvement resulting from the acoustic treatment giving them the benefits of the "bass reflex" and "peri-dynamic" principles are shown by the solid line-tone quality never before obtainable from any radio—and tone today obtainable *only* from the MASTERPIECE V in one of these beautiful and now acoustically perfect consoles. Any one of them will bring to its user two or three octaves of deep, vibrant bass tones, between 30 and 130 to 180 cycles which he has never heard through any radio before. As such they are a most remarkable and beautifully simple contribution to the art of sound reproduction.

"Hey, Dad, make it whistle when my train goes around a curve, will yuh?"

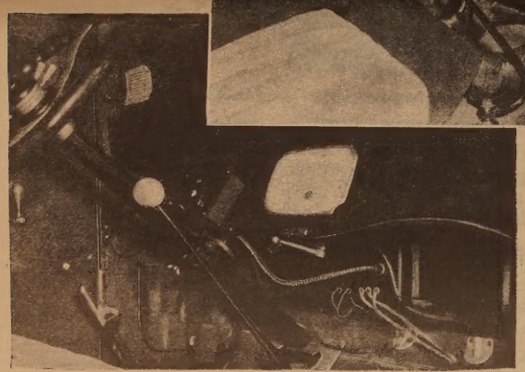
18

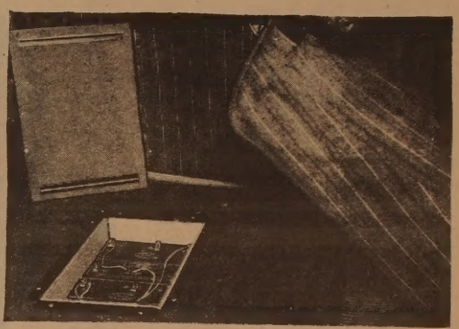
RADIO NEWS FOR JULY, 1930

Radio

RADIO-EQUIPPED automobiles are coming into increased daily use. The photographs shown on these pages illustrate only a few of the many makes of auto-radio receivers being manufactured for set users and builders. Automobile manufacturers are equipping their cars with built-in antennas, other manufacturers have set up machines to turn out specially constructed resistors for the elimination of ignition interference, while

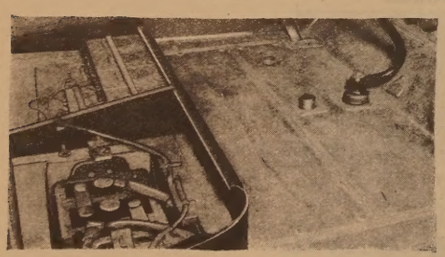
The photograph to the right and the one below illustrate how Samuel Egert's auto-radio installation fits under the dash, with the tuning and volume control box located on the driving shaft. This auto receiver was described fully in the March and April issues of RADIO NEWS. Note the location of the loud speaker forward of the driver and fastened to the roof of the car



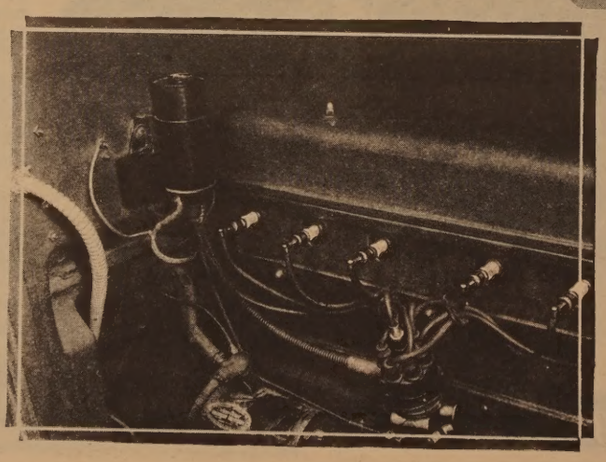


This battery box, containing the "B," "C" and "D" batteries for the Crosley Roamio auto receiver is located just aft the driver's seat in a coach model of car. The cover for the box, which is watertight, is shown in the corner of the picture

(*Below*)
A Buick, its engine fitted with resistors in each of the spark plug leads and one in the central lead to the distributor. These resistors, together with the by-pass condenser connected to the induction coil, aid in suppressing interference noise generated by the ignition system



In Egert's Nash ample room for housing the "B" batteries is provided underneath the driver's seat, as shown in the above photograph. The car battery supplies "A" current also to the tubes of the radio receiver



(*Above*)
So compact is the Transitone auto-radio receiver equipment that it fits snugly underneath the dash without being at all visible to the eye. The tuning-volume control dial offers the only suggestion that an auto-radio installation is contained in the car, excepting of course when it is operating. Then wonderment is expressed as to where on earth the set can be located

No wireless receiving set complete without

New Magnavox Combination Set

A2-R insures convenient and perfect Radio reproduction. Designed especially to meet the requirements of receiving sets used in the home.

Magnavox Radio

The Reproducer Supreme

IT has been the dream of every Radio user to own in one unit a Power Amplifier and electro-dynamic Reproducer, thus insuring perfect Radio reproduction.

After exhaustive study and tests by our engineers, this has been successfully accomplished, and the new instruments of the unit type here illustrated in one and two stages of amplification may now be had through Magnavox dealers everywhere.

There is now a Magnavox for every receiving set. The full line embraces:

Magnavox Reproducers

R2 with 18-inch curvex horn . $60.00
R3 with 14-inch curvex horn . 35.00
M1 with 14-inch curvex horn. Equipped with binding posts and a five foot flexible cord; requires no battery for the field. 35.00

Magnavox Combination Sets

A1-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 1-stage of amplification 59.00
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Special: with 14-inch curvex horn as illustrated . . . 85.00

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World pioneers in the development and manufacture of sound amplifying apparatus

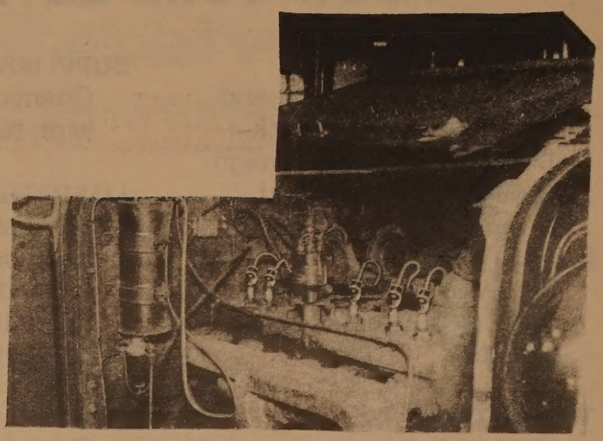
Magnavox Reproducers and Amplifiers

RADIO NEWS FOR JULY, 1930

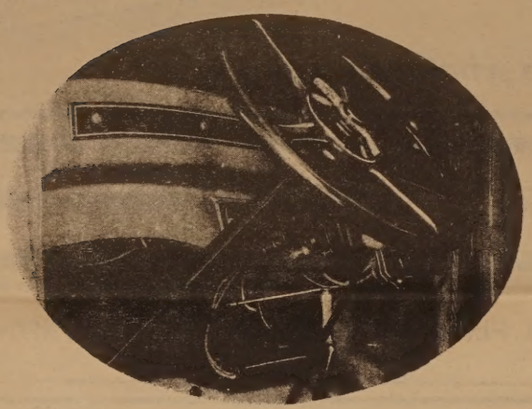
goes a'Motoring

still others are producing loud speakers particularly adapted to automobile use.

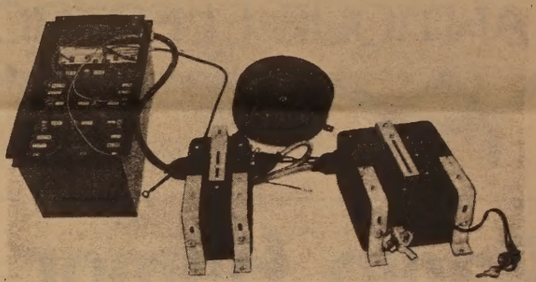
Truly, automobile radio is here and here to stay. The photographs on these pages illustrate several of the prominent makes of automobile radio receivers and methods employed in the installation of their associated equipment. Also some receivers, batteries, loud speakers and tuning control mechanisms are shown.



In an automobile each of the spark plugs acts as a miniature spark transmitter sending out a broadly tuned wave which, when the car is installed with a radio receiver, sets up a continuous crackle or roar in the loud speaker. To suppress this type of interference, resistors of about 25,000 to 50,000 ohms are inserted in series with each of the spark plug leads

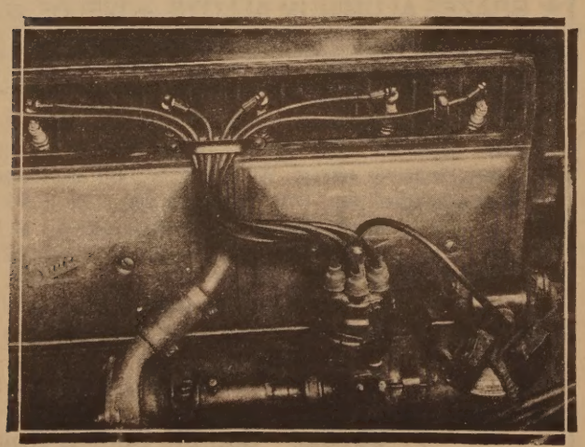


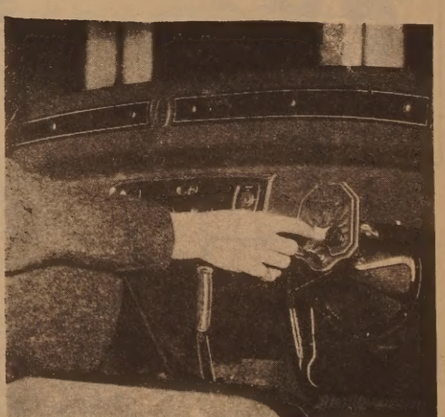
(*Above*)
Here's the other part of the Crosley auto-radio outfit. The control dial fastens on the dash, while the receiver and speaker attach to the bulkhead, separating the engine compartment from the driver's. A straight shaft having two universal joints connects the dial mechanism to the receiver condenser shaft



The several units of the Transitone auto-radio installation are shown above. At the extreme right is shown the filament switch, then the tuner unit, next the speaker (to the rear) and then the audio amplifier unit. At the left is shown the battery box

(*Below*)
Another spark plug resistor-installation. In some cases the entire ignition system has been shielded by the use of flexible copper sheathing which covers each of the high tension wires. Here, too, by-pass condensers have been employed in the generator circuit to cut down interference noise





Behind the dash-mounted tuning control panel of the Crosley "Roamio" may be seen the receiver unit with loud speaker fastened to its face. A key switch on the control panel prevents tampering or otherwise inadvertently leaving the set turned on when not desired

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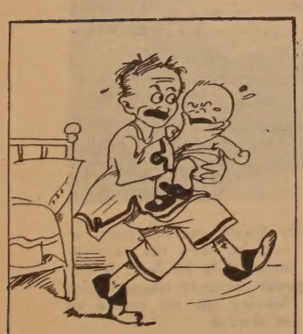
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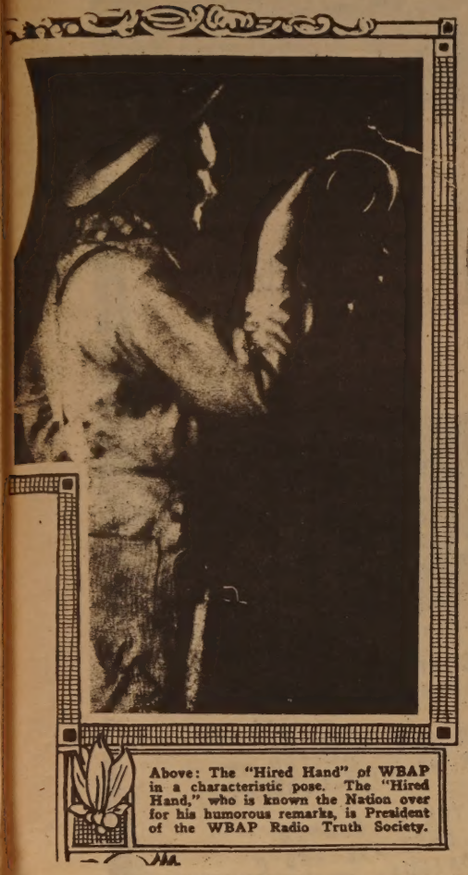

Above: The "Hired Hand" of WBAP in a characteristic pose. The "Hired Hand," who is known the Nation over for his humorous remarks, is President of the WBAP Radio Truth Society.

Radio News for October, 1923

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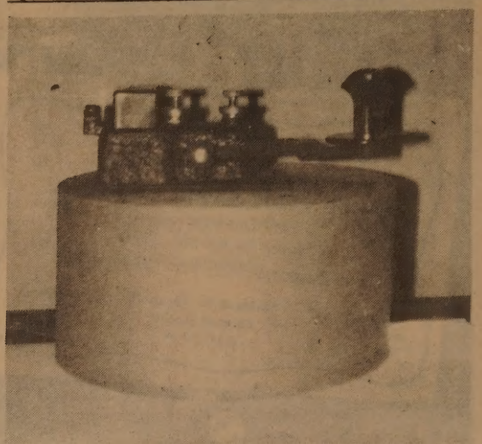
GENERAL



USN FLAMEPROOF KEYS, new , 1955 milspec airless sealed packages, $57.00 shipped U.S.A. telegraph items, parts, old drawings, patents and advertisements. Old galvanometer meter, etc. microphones, 1962 RCA, 1970 TEC portable and other stuff. $1.00 and SASE for illustrated 6 page list (refunded with order) Jos. Jacobs, 60 Seaview Terrace, Northport, NY 11768.

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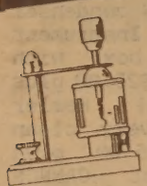

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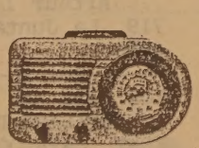

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